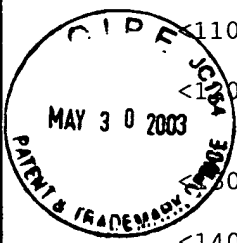


# SEQUENCE LISTING

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Asp Leu Glu Gly Thr Thr Ala Leu Gly Leu Val Lys Thr Ala Glu Asn	
900 905 910	
tta ggt ttc gaa acg aag gcg att caa gct gat atg agt ttg ttt gaa	3963
Leu Gly Phe Glu Thr Lys Ala Ile Gln Ala Asp Met Ser Leu Phe Glu	

915	920	925	930	
gtc gca gat tta cca ttt cct ttt att gca cat gtt cta aaa aat ggc				4011
Val Ala Asp Leu Pro Phe Pro Phe Ile Ala His Val Leu Lys Asn Gly				
935		940	945	
gag cta tta cat tat tat gtt gta cta ggg ata aaa aaa gat gcc att				4059
Glu Leu Leu His Tyr Tyr Val Val Leu Gly Ile Lys Lys Asp Ala Ile				
950		955	960	
ata atc gcc gat cct gat cca aca gtg ggc atc gct aag atg acg caa				4107
Ile Ile Ala Asp Pro Asp Pro Thr Val Gly Ile Ala Lys Met Thr Gln				
965		970	975	
tca cag ttt aaa tcg gaa tgg acg ggc gtt gca tta ttt att gct cca				4155
Ser Gln Phe Lys Ser Glu Trp Thr Gly Val Ala Leu Phe Ile Ala Pro				
980		985	990	
aaa ccg agc tat caa cca gtt aag cag caa aca aaa gcg agt tta				4200
Lys Pro Ser Tyr Gln Pro Val Lys Gln Gln Thr Lys Ala Ser Leu				
995		1000	1005	
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Phe Ser Phe Val Pro Thr Leu Met Gln Gln Lys Arg Leu Val Ile				
1010		1015	1020	
aat att act ttg gcg gcg cta ctc ata acc att att agt att cta				4290
Asn Ile Thr Leu Ala Ala Leu Leu Ile Thr Ile Ile Ser Ile Leu				
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gga tct tat ttc tta cag act gtc att gat acc tat atc cca aat				4335
Gly Ser Tyr Phe Leu Gln Thr Val Ile Asp Thr Tyr Ile Pro Asn				
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aac atg cag agc acg ctg gcg att gtt gca att ggt tta att atc				4380
Asn Met Gln Ser Thr Leu Ala Ile Val Ala Ile Gly Leu Ile Ile				
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Phe Tyr Gly Phe Gln Ser Ile Phe Thr Tyr Ala Gln Asn Phe Leu				
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ttg gcg gtt tta gga cag cgg tta tca att gag att att tta agt				4470
Leu Ala Val Leu Gly Gln Arg Leu Ser Ile Glu Ile Ile Leu Ser				
1085		1090	1095	
tac tta aga cat gtt ttt gaa tta cca atg tct ttt ttt gca aca				4515
Tyr Leu Arg His Val Phe Glu Leu Pro Met Ser Phe Phe Ala Thr				
1100		1105	1110	
cgt aaa aca ggt gaa ata att tca cga ttt aat gac gcg aat aaa				4560
Arg Lys Thr Gly Glu Ile Ile Ser Arg Phe Asn Asp Ala Asn Lys				
1115		1120	1125	
att att gat gcg cta gca agc gca att att tca att ttt tta gat				4605
Ile Ile Asp Ala Leu Ala Ser Ala Ile Ile Ser Ile Phe Leu Asp				
1130		1135	1140	

att	aca	gtc	gtt	gtt	att	atg	ggg	att	att	ctg	atc	att	caa	aat	4650
Ile	Thr	Val	Val	Val	Ile	Met	Gly	Ile	Ile	Leu	Ile	Ile	Gln	Asn	
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aca	act	tta	ttc	tgg	tta	acc	tta	gca	gtg	att	cca	atc	tat	att	4695
Thr	Thr	Leu	Phe	Trp	Leu	Thr	Leu	Ala	Val	Ile	Pro	Ile	Tyr	Ile	
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gcc	gtg	att	act	tta	ttt	gca	aaa	cct	ttt	gaa	aaa	tta	aat	caa	4740
Ala	Val	Ile	Thr	Leu	Phe	Ala	Lys	Pro	Phe	Glu	Lys	Leu	Asn	Gln	
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Lys	Glu	Met	Glu	Ser	Asn	Ala	Val	Leu	Asn	Ser	Ala	Ile	Ile	Glu	
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Asp	Leu	His	Gly	Ile	Glu	Thr	Ile	Lys	Ala	Leu	Thr	Ser	Glu	Ser	
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gaa	cga	tat	caa	aaa	ata	gat	aca	gca	ttt	gtt	gat	tat	ctg	aag	4875
Glu	Arg	Tyr	Gln	Lys	Ile	Asp	Thr	Ala	Phe	Val	Asp	Tyr	Leu	Lys	
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Lys	Ser	Phe	Asp	Tyr	Val	Lys	Ala	Asp	Thr	Leu	Gln	Gln	Ala	Ile	
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Lys	Leu	Phe	Val	Gln	Leu	Gly	Leu	Asn	Val	Phe	Val	Leu	Trp	Val	
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Gly	Ala	Ile	Leu	Val	Thr	His	Asn	Glu	Leu	Ser	Ile	Gly	Gln	Leu	
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Met	Thr	Tyr	Asn	Ala	Leu	Leu	Ala	Tyr	Phe	Val	Asn	Pro	Leu	Gln	
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Asn	Ile	Ile	Asn	Leu	Gln	Thr	Lys	Leu	Gln	Ser	Ala	Arg	Val	Ala	
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Asn	Asn	Arg	Leu	Asn	Glu	Val	Tyr	Leu	Val	Asp	Ser	Glu	Phe	Lys	
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Thr	Glu	Arg	Pro	Ile	Lys	Ser	Glu	Ser	Gln	Leu	Val	Gly	Pro	Ile	
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Glu	Leu	Gln	Asn	Val	Ser	Tyr	Gln	Tyr	Gly	Tyr	Gly	Gln	Arg	Val	
1340					1345					1350					

ctt	gaa	tcg	att	agt	tta	aag	att	gag	ccg	aat	gaa	aaa	tta	aca	5280
Leu	Glu	Ser	Ile	Ser	Leu	Lys	Ile	Glu	Pro	Asn	Glu	Lys	Leu	Thr	
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Ile	Val	Gly	Met	Ser	Gly	Ser	Gly	Lys	Ser	Thr	Leu	Val	Lys	Leu	
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Leu	Val	Asn	Phe	Phe	Glu	Pro	Thr	Glu	Gly	Lys	Val	Leu	Phe	Asn	
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Gln	Gln	Asp	Thr	Gln	Thr	Ile	Asp	Lys	Lys	Thr	Leu	Arg	Gln	Phe	
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Val	Asn	Tyr	Ile	Ala	Gln	Thr	Pro	Tyr	Ile	Phe	Ser	Gly	Ser	Ile	
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Trp	Asp	Asn	Leu	Lys	Leu	Gly	Asn	Arg	Pro	Gly	Ile	Thr	Gln	Ala	
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Asp	Ile	Met	His	Ala	Cys	Glu	Leu	Ala	Glu	Ile	Lys	Asn	Asp	Ile	
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Glu	Lys	Met	Pro	Leu	Gln	Phe	Glu	Thr	Leu	Leu	Asp	Glu	Asp	Gly	
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Asn	Thr	Leu	Ser	Gly	Gly	Gln	Lys	Gln	Arg	Leu	Thr	Ile	Ala	Arg	
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Ala	Leu	Leu	Ser	Pro	Ala	Arg	Val	Leu	Ile	Phe	Asp	Glu	Ser	Thr	
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Ser	Gly	Leu	Asp	Thr	Ile	Thr	Glu	Gly	Leu	Leu	Val	Asp	His	Leu	
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atg	gcg	tta	gaa	gaa	aga	aca	atc	att	ttc	ata	gcg	cat	cgt	tta	5775
Met	Ala	Leu	Glu	Glu	Arg	Thr	Ile	Ile	Phe	Ile	Ala	His	Arg	Leu	
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gcg	att	gct	aag	aaa	acg	aac	aat	att	ctt	gtt	tta	gaa	aat	ggt	5820
Ala	Ile	Ala	Lys	Lys	Thr	Asn	Asn	Ile	Leu	Val	Leu	Glu	Asn	Gly	
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agt	gtt	gtt	gaa	act	ggg	aca	cat	gat	gcg	ttg	gtg	gat	aca	caa	5865
Ser	Val	Val	Glu	Thr	Gly	Thr	His	Asp	Ala	Leu	Val	Asp	Thr	Gln	
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Gly	Arg	Tyr	Tyr	Gln	Leu	Leu	Asn	His						Met	
1565					1570										
gat	aaa	gag	ttt	ctg	gag	agc	agt	gag	ttt	tat	agt	gcg	cgg	ttt	5957
Asp	Lys	Glu	Phe	Leu	Glu	Ser	Ser	Glu	Phe	Tyr	Ser	Ala	Arg	Phe	
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Lys	Asn	Phe	Ser	Thr	Leu	Leu	Ile	Met	Pro	Ile	Ala	Val	Leu	Leu	
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tgt	ctc	gta	tgc	atc	ttt	tct	ttt	ttt	ggt	aaa	cga	gaa	att	acg	6047
Cys	Leu	Val	Cys	Ile	Phe	Ser	Phe	Phe	Gly	Lys	Arg	Glu	Ile	Thr	
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Ile	Glu	Gly	Gln	Gly	Asp	Leu	Thr	Thr	Asn	Lys	Gln	Ile	Pro	Ile	
1620					1625					1630					
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Leu	Gln	Ala	Ser	Thr	Asn	Ser	Val	Leu	Lys	Gln	Asn	Tyr	Leu	Lys	
1635					1640					1645					
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Glu	Gly	Lys	Phe	Val	Lys	Lys	Gly	Gln	Thr	Leu	Leu	Val	Tyr	Gln	
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Asn	Thr	Lys	Asn	Gln	Asn	Gln	Lys	Arg	Leu	Leu	Glu	Lys	Gln	Gln	
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Asp	Asn	Leu	Ser	Tyr	Gln	Ile	Thr	Ser	Leu	Glu	Thr	Leu	Lys	Ala	
1680					1685					1690					
agc	att	cgc	agt	aat	caa	gac	caa	ttt	gag	aat	aat	gat	cag	ttt	6317
Ser	Ile	Arg	Ser	Asn	Gln	Asp	Gln	Phe	Glu	Asn	Asn	Asp	Gln	Phe	
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ggt	tac	aga	gat	tta	tta	cga	ggt	tat	ctt	gac	caa	aga	caa	gtt	6362
Gly	Tyr	Arg	Asp	Leu	Leu	Arg	Gly	Tyr	Leu	Asp	Gln	Arg	Gln	Val	
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Tyr	Leu	Ile	Glu	Asn	Gln	Met	Val	Thr	Asp	Lys	Ala	Ala	Thr	Ser	
1725					1730					1735					
aca	act	aaa	caa	cag	aca	ttg	aca	gcg	att	atg	gat	aag	aca	att	6452
Thr	Thr	Lys	Gln	Gln	Thr	Leu	Thr	Ala	Ile	Met	Asp	Lys	Thr	Ile	
1740					1745					1750					
caa	cga	gat	caa	aca	aat	ctt	gac	gcg	tat	caa	gct	tta	tat	cag	6497
Gln	Arg	Asp	Gln	Thr	Asn	Leu	Asp	Ala	Tyr	Gln	Ala	Leu	Tyr	Gln	
1755					1760					1765					
tca	atc	aaa	act	aac	aag	gta	tat	tca	agt	act	ggt	aaa	tat	aat	6542
Ser	Ile	Lys	Thr	Asn	Lys	Val	Tyr	Ser	Ser	Thr	Gly	Lys	Tyr	Asn	

1770	1775	1780	
tat ctt tac gag aac tat	caa acg aaa gta aaa	gcg atg tct gat	6587
Tyr Leu Tyr Glu Asn Tyr	Gln Thr Lys Val Lys	Ala Met Ser Asp	
1785	1790	1795	
aaa aat gaa caa agt ggt	tta aaa gca gat att	tta gca acg acg	6632
Lys Asn Glu Gln Ser Gly	Leu Lys Ala Asp Ile	Leu Ala Thr Thr	
1800	1805	1810	
caa caa caa att gat agt	tta caa ggt agt ata	gcg aat gcc gaa	6677
Gln Gln Gln Ile Asp Ser	Leu Gln Gly Ser Ile	Ala Asn Ala Glu	
1815	1820	1825	
aat caa aaa gtt tcc ata	aaa gaa ttt gac gat	agc cgg ttt aat	6722
Asn Gln Lys Val Ser Ile	Lys Glu Phe Asp Asp	Ser Arg Phe Asn	
1830	1835	1840	
acg aat act aat aat gaa	aag tta gca tta tta	gaa gca cag caa	6767
Thr Asn Thr Asn Asn Glu	Lys Leu Ala Leu Leu	Glu Ala Gln Gln	
1845	1850	1855	
aca caa tca gca aat gaa	cag ctt gta aaa gct	aaa caa tca ctt	6812
Thr Gln Ser Ala Asn Glu	Gln Leu Val Lys Ala	Lys Gln Ser Leu	
1860	1865	1870	
gtc gaa ata caa aca act	tta aaa caa ata acg	agt gat tct aag	6857
Val Glu Ile Gln Thr Thr	Leu Lys Gln Ile Thr	Ser Asp Ser Lys	
1875	1880	1885	
gaa tac gtg gtt aaa gca	cct aaa gac gga gtt	cta cat gtt gat	6902
Glu Tyr Val Val Lys Ala	Pro Lys Asp Gly Val	Leu His Val Asp	
1890	1895	1900	
gat cac tat caa ggg att	aag tat acg agt gct	ggg acc agt atg	6947
Asp His Tyr Gln Gly Ile	Lys Tyr Thr Ser Ala	Gly Thr Ser Met	
1905	1910	1915	
gcg cgg att tat ccg gta	tta gct gat cag aag	aga tta aaa ata	6992
Ala Arg Ile Tyr Pro Val	Leu Ala Asp Gln Lys	Arg Leu Lys Ile	
1920	1925	1930	
gaa gcg ctt att cca gtt	gat gat att tca tca	gtt aaa att gga	7037
Glu Ala Leu Ile Pro Val	Asp Asp Ile Ser Ser	Val Lys Ile Gly	
1935	1940	1945	
caa aga cta cgt ttg aaa	att acg cgg aat gtt	cca aga cca att	7082
Gln Arg Leu Arg Leu Lys	Ile Thr Arg Asn Val	Pro Arg Pro Ile	
1950	1955	1960	
att att gaa gga aag atc	aat caa att agt gtt	tcg cct act gtt	7127
Ile Ile Glu Gly Lys Ile	Asn Gln Ile Ser Val	Ser Pro Thr Val	
1965	1970	1975	
att aac cag ggg agt tac	tac act att ata ggt	ctg gca act att	7172
Ile Asn Gln Gly Ser Tyr	Tyr Thr Ile Ile Gly	Leu Ala Thr Ile	
1980	1985	1990	

tct aat aat aat agg aaa tta ctg cat tat gga atg acc ggt aaa 7217  
 Ser Asn Asn Asn Arg Lys Leu Leu His Tyr Gly Met Thr Gly Lys  
 1995 2000 2005

ata gca att atc act ggt aag aca aca ttc ttc aac tat tac aaa 7262  
 Ile Ala Ile Ile Thr Gly Lys Thr Thr Phe Phe Asn Tyr Tyr Lys  
 2010 2015 2020

gat aag ttg ttg aat aga aat tag gtgggtatta ccatataaat 7306  
 Asp Lys Leu Leu Asn Arg Asn  
 2025 2030

tatgagagtt tccttggttt aaaattaatt tgaaaattga tattagcggt taacagttaa 7366

attaatacgt taataatttt tttgtcttta aatagggatt tgaagcataa tgggtgttata 7426

gcgtacttag ctggccagca tatatgtatt ctataaaata ctattacaag gagatttttag 7486

atatgcaaaa tacaaaagaa ctaagcgtag tagaattaca acaaattctt ggaggaaaac 7546

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Ile Leu Leu Ile Phe Leu Leu Tyr Arg Tyr Ile Gln Arg Lys Ile Thr  
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Phe Lys Arg Ile Ile Leu Asp Ile Leu Ile Ala Ile Ile Phe Ser Ile  
 35 40 45

Leu Tyr Leu Phe Ile Ser Asp Ala Ser Leu Leu Val Met Val Leu Met  
 50 55 60

Arg Leu Gly Trp His Phe His Gln Gln Lys Glu Asn Lys Ile Lys Thr  
 65 70 75 80

Thr Asp Thr Ala Asn Leu Ile Leu Ile Ile Val Ile Gln Leu Leu Leu  
 85 90 95

Val Ala Val Gly Thr Ile Ile Ser Gln Phe Thr Ile Ser Ile Ile Lys  
 100 105 110



Ser Asp Phe Ser Gln Asn Ile Leu Asn Asn Ser Ala Thr Asp Ile Thr  
115 120 125

Leu Leu Gly Ile Phe Phe Ala Val Leu Phe Asp Gly Leu Phe Phe Ile  
130 135 140

Leu Leu Lys Asn Lys Arg Thr Glu Leu Gln His Leu Asn Gln Glu Ile  
145 150 155 160

Ile Glu Phe Ser Leu Glu Lys Gln Tyr Phe Ile Phe Ile Phe Ile Leu  
165 170 175

Phe Ile Val Ile Glu Ile Ile Leu Ala Val Gly Asn Leu Gln Gly Val  
180 185 190

Thr Ala Thr Ile Leu Leu Thr Ile Ile Ile Ile Phe Cys Val Leu Ile  
195 200 205

Gly Met Thr Phe Trp Gln Val Met Leu Phe Leu Lys Ala Tyr Ser Ile  
210 215 220

Arg Gln Glu Ala Asn Asp Gln Leu Val Arg Asn Gln Gln Leu Gln Asp  
225 230 235 240

Tyr Leu Val Asn Ile Glu Gln Gln Tyr Thr Glu Leu Arg Arg Phe Lys  
245 250 255

His Asp Tyr Gln Asn Ile Leu Leu Ser Leu Glu Ser Phe Ala Glu Lys  
260 265 270

Gly Asp Gln Gln Gln Phe Lys Ala Tyr Tyr Gln Glu Leu Leu Ala Gln  
275 280 285

Arg Pro Ile Gln Ser Glu Ile Gln Gly Ala Val Ile Ala Gln Leu Asp  
290 295 300

Tyr Leu Lys Asn Asp Pro Ile Arg Gly Leu Val Ile Gln Lys Phe Leu  
305 310 315 320

Ala Ala Lys Gln Ala Gly Val Thr Leu Lys Phe Glu Met Thr Glu Pro  
325 330 335

Ile Glu Leu Ala Thr Ala Asn Leu Leu Thr Val Ile Arg Ile Ile Gly  
340 345 350

Ile Leu Leu Asp Asn Ala Ile Glu Gln Ala Val Gln Glu Thr Asp Gln  
355 360 365

Leu Val Ser Cys Ala Phe Leu Gln Ser Asp Gly Leu Ile Glu Ile Thr  
370 375 380

Ile Glu Asn Thr Ala Ser Gln Val Lys Asn Leu Gln Ala Phe Ser Glu  
385 390 395 400

Leu Gly Tyr Ser Thr Lys Gly Ala Gly Arg Gly Thr Gly Leu Ala Asn  
405 410 415

Val Gln Asp Leu Ile Ala Lys Gln Thr Asn Leu Phe Leu Glu Thr Gln  
420 425 430

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Thr Leu Thr Cys Ala Ala Ser Asp Thr Glu Thr Leu Leu Ala Ala Ile  
35 40 45

Lys Asp Gln Gln Arg Gly Leu Phe Phe Leu Asp Met Glu Ile Glu Asp  
50 55 60

Asn Arg Gln Ala Gly Leu Glu Val Ala Thr Lys Ile Arg Gln Met Met  
65 70 75 80

Pro Phe Ala Gln Ile Val Phe Ile Thr Thr His Glu Glu Leu Thr Leu

85

90

95

Leu Thr Leu Glu Arg Lys Ile Ala Pro Leu Asp Tyr Ile Leu Lys Asp  
 100 105 110

Gln Thr Met Ala Glu Ile Lys Arg Gln Leu Ile Asp Asp Leu Leu Leu  
 115 120 125

Ala Glu Lys Gln Asn Glu Ala Ala Ala Tyr His Arg Glu Asn Leu Phe  
 130 135 140

Ser Tyr Lys Ile Gly Pro Arg Phe Phe Ser Leu Pro Leu Lys Glu Val  
 145 150 155 160

Val Tyr Leu Tyr Thr Glu Lys Glu Asn Pro Gly His Ile Asn Leu Leu  
 165 170 175

Ala Val Thr Arg Lys Val Thr Phe Pro Gly Asn Leu Asn Ala Leu Glu  
 180 185 190

Ala Gln Tyr Pro Met Leu Phe Arg Cys Asp Lys Ser Tyr Leu Val Asn  
 195 200 205

Leu Ser Asn Ile Ala Asn Tyr Asp Ser Lys Thr Arg Ser Leu Lys Phe  
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Val Ala Lys Leu Lys Gln Met Met  
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Met Glu Lys Phe Ile Glu Leu Ser Leu Lys Glu Val Thr Ala Ile Thr  
 1 5 10 15

Gly Gly Lys Tyr Tyr Gly Asn Gly Val His Cys Gly Lys His Ser Cys  
 20 25 30

Thr Val Asp Trp Gly Thr Ala Ile Gly Asn Ile Gly Asn Asn Ala Ala  
 35 40 45

Ala Asn Trp Ala Thr Gly Gly Asn Ala Gly Trp Asn Lys  
 50 55 60

<210> 17  
 <211> 98  
 <212> PRT  
 <213> Lactobacillus sakei

<400> 17

Met Lys Ile Leu Lys Trp Tyr Ser Gly Gly Lys Asp Arg Gly Glu Arg  
 1 5 10 15

Ala Asn Asp Ile Ile Gly Gln Leu Leu Leu Asp Leu Asn His Asp Pro  
 20 25 30

Lys Asn Glu His Leu Glu Ala Ile Leu Ile Asn Tyr Gln Asn Glu Ile  
 35 40 45

Lys Arg Lys Glu Ser Ser Val Pro Phe Ile Leu Ser Arg Met Asn Ile  
 50 55 60

Ser Ile Ala Asn Thr Ile Arg Arg Asp Arg Leu Ile Leu Thr Asp Phe  
 65 70 75 80

Gln Glu Asp Lys Leu Lys Leu Leu Thr Ala Leu Ser Asn Ile Arg Tyr  
 85 90 95

Gly Tyr

<210> 18  
 <211> 718  
 <212> PRT  
 <213> Lactobacillus sakei

<400> 18

Met Ile Asp Arg Lys Ile Tyr Ile Pro Gln Val Asp Glu Met Asp Cys  
 1 5 10 15

Gly Val Ala Ala Leu Ala Met Ile Leu Lys His Tyr Gly Ser Ser Ala  
 20 25 30

Ser Leu Ala Tyr Leu Arg Asn Glu Ala Lys Thr Asp Leu Glu Gly Thr  
35 40 45

Thr Ala Leu Gly Leu Val Lys Thr Ala Glu Asn Leu Gly Phe Glu Thr  
50 55 60

Lys Ala Ile Gln Ala Asp Met Ser Leu Phe Glu Val Ala Asp Leu Pro  
65 70 75 80

Phe Pro Phe Ile Ala His Val Leu Lys Asn Gly Glu Leu Leu His Tyr  
85 90 95

Tyr Val Val Leu Gly Ile Lys Lys Asp Ala Ile Ile Ile Ala Asp Pro  
100 105 110

Asp Pro Thr Val Gly Ile Ala Lys Met Thr Gln Ser Gln Phe Lys Ser  
115 120 125

Glu Trp Thr Gly Val Ala Leu Phe Ile Ala Pro Lys Pro Ser Tyr Gln  
130 135 140

Pro Val Lys Gln Gln Thr Lys Ala Ser Leu Phe Ser Phe Val Pro Thr  
145 150 155 160

Leu Met Gln Gln Lys Arg Leu Val Ile Asn Ile Thr Leu Ala Ala Leu  
165 170 175

Leu Ile Thr Ile Ile Ser Ile Leu Gly Ser Tyr Phe Leu Gln Thr Val  
180 185 190

Ile Asp Thr Tyr Ile Pro Asn Asn Met Gln Ser Thr Leu Ala Ile Val  
195 200 205

Ala Ile Gly Leu Ile Ile Phe Tyr Gly Phe Gln Ser Ile Phe Thr Tyr  
210 215 220

Ala Gln Asn Phe Leu Leu Ala Val Leu Gly Gln Arg Leu Ser Ile Glu  
225 230 235 240

Ile Ile Leu Ser Tyr Leu Arg His Val Phe Glu Leu Pro Met Ser Phe  
245 250 255

Phe Ala Thr Arg Lys Thr Gly Glu Ile Ile Ser Arg Phe Asn Asp Ala  
 260 265 270

Asn Lys Ile Ile Asp Ala Leu Ala Ser Ala Ile Ile Ser Ile Phe Leu  
 275 280 285

Asp Ile Thr Val Val Val Ile Met Gly Ile Ile Leu Ile Ile Gln Asn  
 290 295 300

Thr Thr Leu Phe Trp Leu Thr Leu Ala Val Ile Pro Ile Tyr Ile Ala  
 305 310 315 320

Val Ile Thr Leu Phe Ala Lys Pro Phe Glu Lys Leu Asn Gln Lys Glu  
 325 330 335

Met Glu Ser Asn Ala Val Leu Asn Ser Ala Ile Ile Glu Asp Leu His  
 340 345 350

Gly Ile Glu Thr Ile Lys Ala Leu Thr Ser Glu Ser Glu Arg Tyr Gln  
 355 360 365

Lys Ile Asp Thr Ala Phe Val Asp Tyr Leu Lys Lys Ser Phe Asp Tyr  
 370 375 380

Val Lys Ala Asp Thr Leu Gln Gln Ala Ile Lys Leu Phe Val Gln Leu  
 385 390 395 400

Gly Leu Asn Val Phe Val Leu Trp Val Gly Ala Ile Leu Val Thr His  
 405 410 415

Asn Glu Leu Ser Ile Gly Gln Leu Met Thr Tyr Asn Ala Leu Leu Ala  
 420 425 430

Tyr Phe Val Asn Pro Leu Gln Asn Ile Ile Asn Leu Gln Thr Lys Leu  
 435 440 445

Gln Ser Ala Arg Val Ala Asn Asn Arg Leu Asn Glu Val Tyr Leu Val  
 450 455 460

Asp Ser Glu Phe Lys Thr Glu Arg Pro Ile Lys Ser Glu Ser Gln Leu  
 465 470 475 480

Val Gly Pro Ile Glu Leu Gln Asn Val Ser Tyr Gln Tyr Gly Tyr Gly  
485 490 495

Gln Arg Val Leu Glu Ser Ile Ser Leu Lys Ile Glu Pro Asn Glu Lys  
500 505 510

Leu Thr Ile Val Gly Met Ser Gly Ser Gly Lys Ser Thr Leu Val Lys  
515 520 525

Leu Leu Val Asn Phe Phe Glu Pro Thr Glu Gly Lys Val Leu Phe Asn  
530 535 540

Gln Gln Asp Thr Gln Thr Ile Asp Lys Lys Thr Leu Arg Gln Phe Val  
545 550 555 560

Asn Tyr Ile Ala Gln Thr Pro Tyr Ile Phe Ser Gly Ser Ile Trp Asp  
565 570 575

Asn Leu Lys Leu Gly Asn Arg Pro Gly Ile Thr Gln Ala Asp Ile Met  
580 585 590

His Ala Cys Glu Leu Ala Glu Ile Lys Asn Asp Ile Glu Lys Met Pro  
595 600 605

Leu Gln Phe Glu Thr Leu Leu Asp Glu Asp Gly Asn Thr Leu Ser Gly  
610 615 620

Gly Gln Lys Gln Arg Leu Thr Ile Ala Arg Ala Leu Leu Ser Pro Ala  
625 630 635 640

Arg Val Leu Ile Phe Asp Glu Ser Thr Ser Gly Leu Asp Thr Ile Thr  
645 650 655

Glu Gly Leu Leu Val Asp His Leu Met Ala Leu Glu Glu Arg Thr Ile  
660 665 670

Ile Phe Ile Ala His Arg Leu Ala Ile Ala Lys Lys Thr Asn Asn Ile  
675 680 685

Leu Val Leu Glu Asn Gly Ser Val Val Glu Thr Gly Thr His Asp Ala  
690 695 700

Leu Val Asp Thr Gln Gly Arg Tyr Tyr Gln Leu Leu Asn His

705

710

715

<210> 19  
 <211> 458  
 <212> PRT  
 <213> Lactobacillus sakei

<400> 19

Met Asp Lys Glu Phe Leu Glu Ser Ser Glu Phe Tyr Ser Ala Arg Phe  
 1 5 10 15

Lys Asn Phe Ser Thr Leu Leu Ile Met Pro Ile Ala Val Leu Leu Cys  
 20 25 30

Leu Val Cys Ile Phe Ser Phe Phe Gly Lys Arg Glu Ile Thr Ile Glu  
 35 40 45

Gly Gln Gly Asp Leu Thr Thr Asn Lys Gln Ile Pro Ile Leu Gln Ala  
 50 55 60

Ser Thr Asn Ser Val Leu Lys Gln Asn Tyr Leu Lys Glu Gly Lys Phe  
 65 70 75 80

Val Lys Lys Gly Gln Thr Leu Leu Val Tyr Gln Asn Thr Lys Asn Gln  
 85 90 95

Asn Gln Lys Arg Leu Leu Glu Lys Gln Gln Asp Asn Leu Ser Tyr Gln  
 100 105 110

Ile Thr Ser Leu Glu Thr Leu Lys Ala Ser Ile Arg Ser Asn Gln Asp  
 115 120 125

Gln Phe Glu Asn Asn Asp Gln Phe Gly Tyr Arg Asp Leu Leu Arg Gly  
 130 135 140

Tyr Leu Asp Gln Arg Gln Val Tyr Leu Ile Glu Asn Gln Met Val Thr  
 145 150 155 160

Asp Lys Ala Ala Thr Ser Thr Thr Lys Gln Gln Thr Leu Thr Ala Ile  
 165 170 175

Met Asp Lys Thr Ile Gln Arg Asp Gln Thr Asn Leu Asp Ala Tyr Gln  
 180 185 190



Ala Leu Tyr Gln Ser Ile Lys Thr Asn Lys Val Tyr Ser Ser Thr Gly  
 195 200 205

Lys Tyr Asn Tyr Leu Tyr Glu Asn Tyr Gln Thr Lys Val Lys Ala Met  
 210 215 220

Ser Asp Lys Asn Glu Gln Ser Gly Leu Lys Ala Asp Ile Leu Ala Thr  
 225 230 235 240

Thr Gln Gln Gln Ile Asp Ser Leu Gln Gly Ser Ile Ala Asn Ala Glu  
 245 250 255

Asn Gln Lys Val Ser Ile Lys Glu Phe Asp Asp Ser Arg Phe Asn Thr  
 260 265 270

Asn Thr Asn Asn Glu Lys Leu Ala Leu Leu Glu Ala Gln Gln Thr Gln  
 275 280 285

Ser Ala Asn Glu Gln Leu Val Lys Ala Lys Gln Ser Leu Val Glu Ile  
 290 295 300

Gln Thr Thr Leu Lys Gln Ile Thr Ser Asp Ser Lys Glu Tyr Val Val  
 305 310 315 320

Lys Ala Pro Lys Asp Gly Val Leu His Val Asp Asp His Tyr Gln Gly  
 325 330 335

Ile Lys Tyr Thr Ser Ala Gly Thr Ser Met Ala Arg Ile Tyr Pro Val  
 340 345 350

Leu Ala Asp Gln Lys Arg Leu Lys Ile Glu Ala Leu Ile Pro Val Asp  
 355 360 365

Asp Ile Ser Ser Val Lys Ile Gly Gln Arg Leu Arg Leu Lys Ile Thr  
 370 375 380

Arg Asn Val Pro Arg Pro Ile Ile Ile Glu Gly Lys Ile Asn Gln Ile  
 385 390 395 400

Ser Val Ser Pro Thr Val Ile Asn Gln Gly Ser Tyr Tyr Thr Ile Ile  
 405 410 415

Gly Leu Ala Thr Ile Ser Asn Asn Asn Arg Lys Leu Leu His Tyr Gly  
420 425 430

Met Thr Gly Lys Ile Ala Ile Ile Thr Gly Lys Thr Thr Phe Phe Asn  
435 440 445

Tyr Tyr Lys Asp Lys Leu Leu Asn Arg Asn  
450 455